

BERESKIN & PARR

UNITED STATES

United States Patent Application

Title: SOLAR POWERED LIGHTING ASSEMBLY

Inventor(s): Kenneth George Michael and Vernon George Michael

Title: SOLAR POWERED LIGHTING ASSEMBLY

This application claims the benefit under 35 U.S.C. 119(e) of U.S. Provisional Application No.60/428,276, filed November 22, 2002.

5

FIELD OF THE INVENTION

This invention relates to a solar powered lighting assembly, and more particularly to a solar powered lighting assembly adapted to be mounted within an eaves trough.

10 **BACKGROUND OF THE INVENTION**

Conventional exterior pot-lighting are commonly used to achieve a desirable decorative soft ambient look for the outside of residential and retail buildings. In fact, halogen pot lights and other forms of high quality recessed lights have become the industry standard.

15 These kinds of external lighting assemblies often involve complex installation procedures, especially when there is insufficient house or building wiring available to power external lights. In such cases, electricians are required to assist in the design and installation processes and permits are required in order to make adjustments to the electrical work in a home or retail building.

20 When installing lighting to the exterior of a home or retail building, a certified electrician is required to survey the home and inspect the existing wiring to ensure that the building and current wiring meets the specifications and requirements in order for them to proceed. The entire process is time consuming, inconvenient and expensive and the investment made is usually only for the 25 period of time during which a building is occupied.

Further, since industry standard lighting sources are not always the most energy efficient light sources, installation of such lighting sources can result in high installation fees and a substantial increase in associated electricity costs. Additionally, the use of expensive light sources (e.g. halogen) for outdoor lighting 30 applications can result in costly and disruptive damage and breakage due to adverse environmental conditions.

SUMMARY OF THE INVENTION

The invention provides in one aspect, a solar powered lighting assembly for mounting within an eaves trough coupled to an outer wall surface,

5 said lighting assembly comprising:

- (a) a lamp;
- (b) a rechargeable power source coupled to said lamp assembly to provide operational power to said lamp assembly;
- (c) a solar panel assembly coupled to the rechargeable power source to provide electrical power for recharging the rechargeable power source;
- 10 (d) a mounting bracket coupled to the inside surface of the eaves trough for supporting said rechargeable power source and said solar panel assembly; and
- (e) a connector arm coupled to said lamp, said connector arm being adapted to be removeably coupled in between said eaves trough and said outer wall surface such that said lamp is positioned to provide light on the outer wall surface.

15 The invention provides in another aspect, a lighting assembly for attachment to an eaves trough mounted on an outer wall surface, said lighting assembly comprising:

- (a) a lamp;
- (b) a power source connected to said lamp to provide operational power to said lamp; and
- 20 (c) a connector arm coupled to said lamp, said connector arm being adapted to be removeably coupled in between said eaves trough and said outer wall surface such that said lamp is positioned to provide light on the outer wall surface.

The invention provides in another aspect, a kit for assembling a solar powered lighting assembly for attachment to an eaves trough mounted on an outer wall surface, said kit comprising:

- 5 (a) a lamp;
- (b) a rechargeable power source adapted to be coupled to said lamp to provide operational power to said lamp;
- (c) a solar panel assembly adapted to be coupled to the rechargeable power source to provide electrical power for recharging the rechargeable power source;
- 10 (d) a mounting bracket adapted to be coupled to the inside surface of the eaves trough for supporting said rechargeable power source and said solar panel assembly; and
- (e) a connector arm adapted to be coupled to said lamp, said connector arm also being adapted to be removeably coupled in between said eaves trough and said outer wall surface.

Further aspects and advantages of the invention will appear from the following description taken together with the accompanying drawings.

20

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a bottom side perspective view of the solar powered lighting assembly of the present invention;

25

FIG. 2A is a side perspective view of the lamp assembly of FIG. 1;

FIG. 2B is a top perspective view of the solar powered lighting assembly of FIG. 1 when the solar powered lighting assembly is installed within an eaves trough;

FIG. 3A is a bottom perspective view of the lamp assembly of FIG. 1 when the solar powered lighting assembly is installed within an eaves trough;

FIG. 3B is a side cross-sectional view of the solar powered lighting assembly of FIG. 1 when the solar powered lighting assembly is installed within
5 an eaves trough;

FIG. 4 is a side perspective view of the solar panel assembly of FIG. 1 in an open position to illustrate the internal elements of the solar panel assembly, when the solar powered lighting assembly is installed within an eaves trough;

10 FIG. 5 is a side perspective view of an alternative lamp assembly for use within the solar power lighting assembly of FIG. 1; and

FIG. 6 is a bottom perspective view of the solar power lighting assembly of FIG. 1 installed within an eaves trough that is mounted to a roof where the connector arm of FIG. 1 extends below the roof such that the lamp
15 element of FIG. 1 is positioned to provide spot lighting on the external wall below.

DETAILED DESCRIPTION OF THE INVENTION

Reference is first made to FIGS. 1, 2A, 2B, 3A, 3B and 4 that show various views of the solar powered lighting assembly 10 made in accordance
20 with a preferred embodiment of the present invention. Solar powered lighting assembly 10 includes a lamp assembly 12, a solar panel assembly 14 and a pair of mounting brackets 16. Lamp assembly 12 includes a lighting element 18 and a connector arm 20 that is adapted to be removably secured between the outer wall surface 15 of an external wall and the inside wall 17 of an eaves trough 19.
25 Solar panel assembly 14 includes a solar panel array 22, a solar panel housing 24 and a rechargeable power source 26 (FIG. 4). Mounting brackets 16 include an eaves trough connector 28, bracket support arms 30 and a brace element 32 (FIG. 1).

Lamp assembly **12** includes a lamp element **18** and a connector arm **20**. Lamp element **18** (FIG. 3A) includes at least one lamp **60**, a lamp housing **62**, a lamp shield **64** and a lamp reflector **66**. Lamp **60** is preferably an LED light source since LED light sources are relatively durable, light-weight, and

5 long lasting due to their low power requirements. However, lamp **60** can be any other type of light generating source (e.g. halogen such as the MR11 halogen bulb with a 12 volt or 24 volt transformer, incandescent, etc.) Lamp housing **62** and lamp shield **64** are preferably manufactured out of durable clear plastic and adapted to form a waterproof housing to protect lamp **60** from environmental

10 factors (e.g. rain, corrosion, shock impacts during storms etc.) Lamp shield **64** is specially manufactured out of durable scratch resistant plastic material and acts as a protective lens for lamp **60**. Lamp shield **64** and lamp reflector **66** are used to help direct and disperse light downward and lamp shield **64** is used to prevent loss of light transmission from lamp **60** through lamp shield **64**.

15 Lamp housing **62** is coupled to connector arm **20** at one end (FIG. 2B) through a rotation joint **57** and rotation pin **58** assembly. As is conventionally known, connector arm **20** includes a rotation cuff **59** within which is mounted rotation pin **58**. Rotation joint **57** is rigidly coupled to lamp housing **62** as shown and can be moved rotatably around rotation pin **58**.

20 Connector arm **20** includes a wedge-shaped section **40** containing a plurality of wedge-shaped edges **52** (FIG. 2B). Connector arm **20** is preferably manufactured out of a durable flexible and resilient plastic material which is suitable for industrial use. Connector arm **20** is adapted to be inserted and secured in position between the outer wall surface **15** and eaves trough wall **17**

25 such that the wedge-shaped section **50** is positioned adjacent to eaves trough wall **17** (FIG. 2B). When connector arm **20** is inserted between the outer wall surface **15** and eaves trough wall **17** and wedge shaped section **50** is positioned adjacent to eaves trough wall **17**, connector arm **20** can be removably secured at various positions allowing lighting element **18** to be positioned at various

30 desirable distances below the eaves trough **19** as will be described.

Once lighting element 18 is positioned at a desirable distance below the eaves trough 19 (FIGS. 3A and 3B), it is possible to pull the connector arm 20 back slightly so that the closest wedge edge 52 engages the top surface of the eaves trough wall 17 to secure connector arm 20 in place. When it is 5 desired to remove light assembly 12 from solar powered lighting assembly 10, it is possible to push connector arm 20 up slightly while using an implement (e.g. a screwdriver) to produce a sufficient space gap between outer wall surface 15 and eaves trough wall 17 to allow connector arm 20 to be pulled down and disengaged without any wedge edges 52 being caught on the top surface of 10 eaves trough 19. It is also possible to break off end parts of connector arm 20 if desired, although since connector arm 20 can be reused, it may be desirable to retain the full extent of connector arm 20.

While it is preferred to use wedge-shaped section 50 to removably secure light assembly 12 in between outer wall surface 15 and eaves trough wall 17, it should be understood that various other methods of securing connector arm in between outer wall surface 15 and eaves trough wall 17 could also be utilized. Connector arm 20 and lamp element 18 together provide for a vertically and/or horizontally adjustable light source.

It should be understood that while the preferred embodiment is 20 designed to allow lamp element 18 to be positioned below eaves trough 19 such that light is provided to the wall below eaves trough, it should be understood that lamp element 18 can also generally be used to provide light to any reasonably proximate location on the wall and that lamp element 18 can also be positioned above eaves trough 19 to again, provide light to any reasonably proximate 25 location on the wall.

Solar panel assembly 14 includes a solar panel array 22, a solar panel housing 24 and a rechargeable power source 26. Solar panel array 22 contains a plurality of solar panels (FIG. 2A). Solar panel array 22 is preferably implemented using a 0.315 Watt 0.45 volt 700 mA Multicrystalline Silicon solar 30 cells manufactured by Photonic Energy Semiconductor Co. Ltd. In Taiwan.

However, it should be understood that any kind of commercially available solar panels which convert solar energy into electrical energy could be used within solar powered lighting assembly 10, depending on their rated performance and the environmental conditions contemplated. Each solar panel within solar panel array 22 is electrically connected to one other as is conventionally known.

Solar panel array 22 is preferably fixed within solar panel housing 24, however solar panel array 22 could also be moveable in various positions to provide for maximum exposure to the rays of the sun. Adjustment to a desired position could be achieved using manual or electrical control means. For example, solar panel array 22 could be manually adjusted at different seasons so that the angle of the array panel is optimized for exposure to the sun. Manual adjustments could be made as seasons change and depending on geographic location of the building on which solar powered lighting assembly 10 is mounted. In another embodiment, the solar array panel may be adjusted using electronic means. The electronic means may be controlled by a remote control. In the latter case, electronic means would be included within solar panel housing 24 (for example in cavity 74) so that the array panel is self-adjusting and tracks the movement of the sun through the sky either continuously or based on computer programming of the device.

Power control circuit 56 (FIG. 4) is a conventionally designed power circuit implemented on a printed circuit board that is used to regulate the supply of electrical power to the lamp 60 as well as to regulate the flow of electrical energy from the solar panel array 22 to rechargeable power source 26 (i.e. to recharge rechargeable batteries). Power control circuit 56 controls the recharging of rechargeable power source 26 by solar panel array 22 to a selected voltage during the day and turns on lamp fixture 18 at night until rechargeable power source 26 discharged to a predetermined voltage. Solar panel array 22 is electrically connected through wires 78 to power control circuit 56 and accordingly light energy received by solar panel array 22 is converted into electrical energy that is provided to power control circuit 56 that in turn is provided to rechargeable power source 26 in an appropriate form of charge.

Power control circuit 56 includes a light sensor (not shown) to determine nighttime and to ensure that light fixture 18 is not operational during the day and a manual switch (not shown) to adjust the amount of time that the light should be on (e.g. 4 or 8 hours). A red LED charge light (not shown) is used to indicate

5 when electrical energy is being supplied by the solar array panel array 22 to rechargeable power source 26 (i.e. during a sunny day). Also, a wire plug 76 is used to interface the output power from power control circuit 56 to lamp assembly 12 through power wire 54 (FIG. 2B). The specific implementation of power control circuit 56 should be understood to be conventional.

10 Solar panel housing 24 is used to provide a watertight enclosure for solar panel array 22 and power source 26 as well as a power control circuit 56, all of which are housed within solar panel housing 24 (FIG. 4). Solar panel housing 24 also includes an end cover 70 that provides a watertight chamber for power source 26 (e.g. AA rechargeable batteries in this case) as shown. When

15 end cover 70 is removed from the end of solar panel housing 24, it is possible to insert power source 26 (e.g. AA rechargeable batteries) into the chamber within solar panel housing 24 as shown. When end cover 70 is secured onto the end of solar panel housing 24, the chamber containing power source 26 is made watertight. It is possible to connect a DC adaptor to the DC adaptor pin 72 when

20 end cover 70 is a secured position.

Mounting brackets 16 include a connector element 28, support arms 30 and a brace element 32. Mounting brackets 16 are preferably manufactured out of durable plastic material, although it should be understood that any durable material (e.g. stainless steel) could be used instead. The

25 substantially C-shaped top ends of connector elements 28 (FIG. 2A) are adapted to snap-fit onto the top edge surfaces of the inner eaves trough wall 17 as shown. Each connector element 28 includes a groove 29 (FIG. 1, 2B and 3A) that is dimensioned to correspond to the width of the top edge surfaces of eaves trough wall 17. When pressure is applied to the top of connector elements 28 (i.e.

30 applied by manual pressure), since the grooves 29 within connector elements 28 are dimensioned to correspond to the width of the top edge surfaces of eaves

trough wall 17, the C-shaped connector elements 28 allow solar panel assembly 14 to be removeably but securely attached to eaves trough wall 17. However, it should be understood that any other conventional coupling method (e.g. drilled holes in connector elements 28 and small screws, a tension based hook and 5 latch mechanism, etc.) could be used to secure connector elements 28 to top edge surfaces of eaves trough wall 17.

It should be understood that while it is preferred for the present invention to use a rechargeable power source 26 in combination with a solar panel array 22 to power lamp assembly 12, lamp assembly 12 could also be 10 powered by any other conventionally available power sources that may or may not be mounted within eaves trough 19. Rather, it is contemplated that more generally, connector arm 20 could be used to mount lamp element 18 above or below an eaves trough through the use of a wedge-shaped section 50 adapted to be positioned in between a outer wall 15 and eaves trough wall 17 regardless of 15 the particular type of power source used. For example, it is contemplated that lamp assembly 12 could be powered by either an AC or DC power source which may or may not be mounted within the eaves trough 19. Power could simply be provided from an AC or DC power source that is mounted below the eaves trough or on the wall. In any case, it is contemplated that the present invention 20 also encompasses the use of a wedge-shaped section 50 of connector arm 20 to secure connector arm 20 in the space between outer wall surface 15 and eaves trough wall 17 such that lamp element 18 is provided either below or above the eaves trough.

FIG. 5 shows an alternative lamp assembly 112 which can be 25 utilized within solar powered lighting assembly 10. Specifically, alternative lamp assembly 112 includes connector arm 120 having a wedge-shaped section 150 and a lamp arm 121 from which extends the lamp element 118. Lamp element 118 includes lamp housing 162, a plurality of LED lamps 160 as well as lamp shield 164. As with lamp assembly 12, lamp 160 is rotatable around a rotation pin 30 58 that is mounted within rotation cuff 159 that allows for manual adjustment of lamp 160 as well as the light emitted from lamp 160. It should be understood that

various other types of lamp fixtures **18** can be used within lamp assembly **12**. As discussed previously, it is contemplated that halogen type lamps could be used although such lamps would require slightly stronger support material (e.g. die cast metals) than those contemplated for the LED design discussed above (e.g. 5 durable plastic materials).

FIG. 6 illustrates how the solar powered lighting assembly **10** looks when looking up from the ground and when mounting bracket **16** is coupled to eaves trough wall **17** and connector arm **20** is inserted in between outer wall surface **15** and eaves trough wall **17**. As shown, lamp element **18** is positioned 10 such that lamp **60** is directed to shine light down on the wall surface **150**. As has been described the installation of solar powered lighting assembly **10** is relatively straight forward and can be accomplished rapidly and without the need to re-wire or relay electrical wires around the periphery of the building. As can be seen, 15 solar powered lighting assembly **10** provides the ability to easily accentuate the exterior of a building with a decorative soft ambient light. It is contemplated that solar powered lighting assembly **10** could also be used to provide security lighting, commercial lighting effects (e.g. associated with advertising elements), home decorative effects wherever eaves trough **19** exist and the like.

Solar powered lighting assembly **10** provides a number of 20 advantages over commercially available external lighting assemblies. First, the solar powered light assembly **10** can be easily mounted and removed from an eaves trough **19**. Second, solar powered lighting assembly **10** can be installed within requiring any re-wiring of existing electrical wiring. Solar array panel **22** can be adjustable in order to maximize the exposure of the solar array panel **22** 25 to the angle of the sun in the sky. Also, solar powered lighting assembly **10** is cost efficient and environmentally friendly which will become a more important feature as energy conservation becomes a more important priority. Accordingly, solar powered lighting assembly **10** provides sustained accessibility to sunlight and preserves the aesthetic appearance of the building.

As will be apparent to those skilled in the art, various modifications and adaptations of the structure described above are possible without departing from the present invention, the scope of which is defined in the appended claims.

For example, various modifications can be made including improvements to

5 lighting and LED technology, structural changes in terms of the materials used in the design, different types of solar array technology with a variety of types of solar array panels, modifications to the electrical circuitry and the selection of a suitable rechargeable power supply. The design for the lighting assembly of the present invention may be modified or varied to accommodate such changes in

10 technology choices while remaining within the scope of the claimed invention.